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| **Unit: Energetics** (16, 3 Cycles) | | | |
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| |  |  | | --- | --- | | **IB Expectations/ Assessment Criteria** |  |   **DP Group 4:Chemistry, DP - Age 16-18, Objectives**  It is the intention of all the Diploma Programme experimental science courses that students achieve the following objectives.   * 1. Demonstrate an understanding of: a. scientific facts and concepts b. scientific methods and techniques c. scientific terminology d. methods of presenting scientific information. * 2. Apply and use: a. scientific facts and concepts b. scientific methods and techniques c. scientific terminology to communicate effectively d. appropriate methods to present scientific information. * 3. Construct, analyse and evaluate: a. hypotheses, research questions and predictions b. scientific methods and techniques c. scientific explanations. * 4. Demonstrate the personal skills of cooperation, perseverance and responsibility appropriate for effective scientific investigation and problem solving. * 5. Demonstrate the manipulative skills necessary to carry out scientific investigations with precision and safety. | | | |
| |  |  | | --- | --- | | **Approach** |  |   Practice driven, since the topic is very mathematical. | | |  |  | | --- | --- | | **Significant concept(s) / Considerations** |  |   Calculations of enthalpy change  Calculate enthalpy change from enthalpy level diagrams.  Calculate Bond enthalpy. | |
| |  |  | | --- | --- | | **Guiding Questions** |  |   Is heat change a universal phenomenon? | | |  |  | | --- | --- | | **Learner Profile** |  |  |  |  | | --- | --- | | * Knowledgeable * Communicators * Principled * Balanced |  | | |
| |  |  | | --- | --- | | **Central Idea / Content** |  |   5.1 Exothermic and endothermic reactions.  5.2 Calculations of enthalpy changes  5.3 Hess's Law  5.4 Bond enthalpy  15.1 Standard enthalpy changes of reaction  15.2 Born Haber cycle  15.3 Entropy  15.4 Spontaneity | | |  |  | | --- | --- | | **Learning Objectives** |  |   Define the terms exothermic reaction, endothermic reaction and standard enthalpy change of reaction (ΔHo).  State that combustion and neutralization are exothermic processes.  Apply the relationship between temperature change, enthalpy change and the classification of a reaction as endothermic or exothermic.  Deduce, from an enthalpy level diagram, the relative stabilities of reactants and products, and the sign of the enthalpy change for the reaction.  Calculate the heat energy change when the temperature of a pure substance is changed.  Design suitable experimental procedures for measuring the heat energy changes of reactions.  Calculate the enthalpy change for a reaction using experimental data on temperature changes, quantities of reactants and mass of water.  Evaluate the results of experiments to determine enthalpy changes.  Determine the enthalpy change of a reaction that is the sum of two or three reactions with known enthalpy changes.  Define the term *average bond enthalpy.*  Explain, in terms of average bond enthalpies, why some reactions are exothermic and others are endothermic.  AHL  Define and apply the terms *standard state, standard enthalpy change of formation*(Δ*H*)fo and *standard enthalpy change of combustion*(Δ*H*)co.  Determine the enthalpy change of a reaction using standard enthalpy changes of formation and combustion.  Define and apply the terms *lattice enthalpy*and *electron affinity*.  Explain how the relative sizes and the charges of ions affect the lattice enthalpies of different ionic compounds.  Construct a Born–Haber cycle for group 1 and 2 oxides and chlorides, and use it to calculate an enthalpy change.  Discuss the difference between theoretical and experimental lattice enthalpy values of ionic compounds in terms of their covalent character.  Discuss the difference between theoretical and experimental lattice enthalpy values of ionic compounds in terms of their covalent character.  State and explain the factors that increase the entropy in a system.  Predict whether the entropy change (Δ*S*) for a given reaction or process is positive or negative.  Calculate the standard entropy change for a reaction (Δ*So*) using standard entropy values (*So*) .  Predict whether a reaction or process will be spontaneous by using the sign of ΔGo.  Calculate ΔGo for a reaction using the equation ΔGo = Δ*Ho-* *T*Δ*So* and by using values of the standard free energy change of formation, Δ*G*fo.  Predict the effect of a change in temperature on the spontaneity of a reaction using standard entropy and enthalpy changes and the equation ΔGo = Δ*Ho -* *T*Δ*So*. | |
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| |  |  | | --- | --- | | **Information Literacy & ICT** |  |   ICT Lab | |  |  | | --- | --- | | **International Mindedness** |  |   Invention of alternative technologies for energy change to save the earth. | | |  |  | | --- | --- | | **TOK** |  | |
| |  |  | | --- | --- | | **Strategies / Activities / Differentiation** |  |   Extra help for students having learning difficulties. | | |  |  | | --- | --- | | **Resources** |  |   Chemistry Course companion  Teacher assisted learning materials  Independent research instruments  Worksheets | |
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